NOTE: THIS SAMPLE REPORT IS MEANT TO SHOW YOU WHAT OUR REPORTS GENERALLY LOOK LIKE. EACH REPORT WILL BE CATERED SPECIFICALLY TO YOUR CASE. NAMES AND LOCATIONS HAVE BEEN CHANGED TO PRESERVE CONFIDENTIALITY.

FWC
FORENSIC WEATHER CONSULTANTS

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FORENSIC WEATHER INVESTIGATION OF THE WEATHER CONDITIONS AND RAIN ACCUMULATION FOR THE PERIOD MARCH 21-22, 2019 AT 1776 LIBERTY WAY IN NEW YORK, NEW YORK

January 11, 2021

CASE NAME:	"William Walters v. New York Property, LLC"
FILE NUMBER:	987654321
DATE AND TIME OF INCIDENT:	March 22, 2019 at 8:05 a.m. EDT
PREPARED FOR:	Mr. Declan McDonald, Esq.
COMPANY:	McDonald, Pfeiffer & LaCosta, LLP

ASSIGNMENT:

This case was assigned to me by McDonald, Pfeiffer & LaCosta, LLP. I was asked to perform an in-depth weather analysis and forensic weather investigation at 1776 Liberty Way in New York, New York in order to determine what the weather conditions were leading up to and including the day of the incident.

Forensic Weather Consultants, LLC uses various reliable sources of weather information in order to conduct a reliable weather analysis. In order to accurately determine the weather conditions that existed leading up to and including the time of the incident, a detailed search was performed to find the closest, official weather stations to the incident location. Using the computer program "Google Earth", weather station locations provided by the National Centers for Environmental Information (NCEI) and MesoWest were plotted and are indicated by a yellow pushpin. MesoWest is a cooperative project that was started at the University of Utah in 1996 with a goal of providing access to current and archived weather observations from across the United States through internet-based resources.

The weather stations that are indicated by an orange pushpin represent Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) stations that are available through the CoCoRaHS network, but not yet available through the NCEI. I have been advised by the NCEI that in order for CoCoRaHS station data to be obtainable through the NCEI, the station must have a minimum of 100 daily surface observation reports. Although these stations have not met this minimum qualification as of yet, and therefore cannot be certified, they are still part of the CoCoRaHS network in which the data is able to be certified once added to the NCEI archive. While not all of the weather data can be certified by the NCEI, it is mostly if not all housed and maintained on National Weather Service websites including ncei.noaa.gov and raws.wrh.noaa.gov and are the records that meteorologists rely upon during the normal course of business to conduct these investigations.

GENERAL REVIEW OF WEATHER DATA SOURCES

Many different types of weather data are gathered and analyzed as part of our investigations. While some, but not necessarily all, of these weather data sources were utilized for this case, we are providing a list of the different types of stations for informational purposes.

The Automated Surface Observing Systems (ASOS) program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). The ASOS systems serve as the nation's primary surface weather observing network. The ASOS systems compile various weather observations, often more than once per hour, called Local Climatological Data (**LCD**) that are reviewed, maintained, and stored by NOAA. ASOS computed wind speeds are the 2-minute average wind speed prior to the time of the observation. ASOS computed wind gusts are the greatest 5-second average wind speed that was measured in the 10 minutes prior to the time of the observation. Wind gusts are reported if the greatest gust exceeds 14 knots (16 MPH). ASOS also computes peak wind gusts which are the greatest 5-second average wind speed that occurred since the last generated Meteorological

Aerodrome Report (METAR). Peak wind gusts are reported if the greatest peak wind gust exceeds 25 knots (29 MPH).

Through the National Weather Service (NWS) Cooperative Observer Program (**COOP**), more than 10,000 volunteers take daily weather observations at National Parks, seashores, mountaintops, and farms as well as in urban and suburban areas. COOP data usually consists of daily maximum and minimum temperatures, snowfall, and 24-hour precipitation totals ending at a specific time, such as 7:00 a.m. in many locations.

The Remote Automatic Weather Stations (**RAWS**) system is a nationwide network of automated weather stations that are often located in remote areas, particularly in national forests. These stations are often run by the Bureau of Land Management and U.S. Forest Service, and they are also monitored by the National Interagency Fire Center (NIFC), primarily to observe potential wildfire conditions.

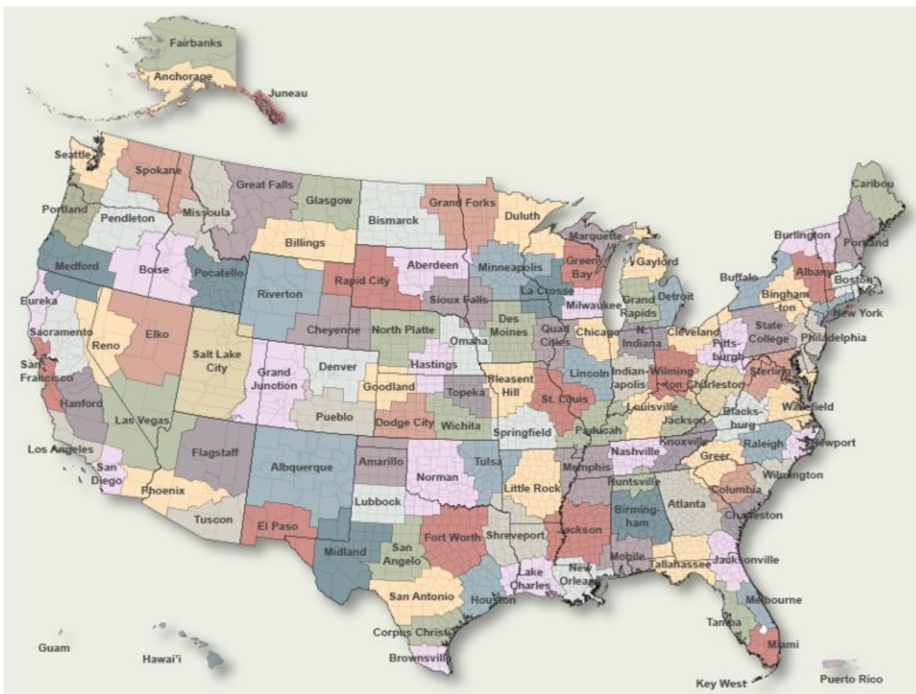
The Community Collaborative Rain, Hail and Snow Network (**CoCoRaHS**) is a network consisting of volunteer weather observers across the United States, Canada, and the Bahamas. These volunteers take daily precipitation measurements and report them to a centralized data store online, where this data is heavily utilized by the NWS, meteorologists, emergency managers and city utilities. CoCoRaHS data is particularly useful in situations where storm systems produce sharp precipitation gradients.

The National Ocean Service (**NOS**) provides data, tools, and services that support coastal economies and their contribution to the national economy. NOS maintains the nation's network of coastal tide and water level sensors to provide real-time data. Among many things, this data supports accurate weather forecasts, coastal storm and flood predictions, and tsunami warnings.

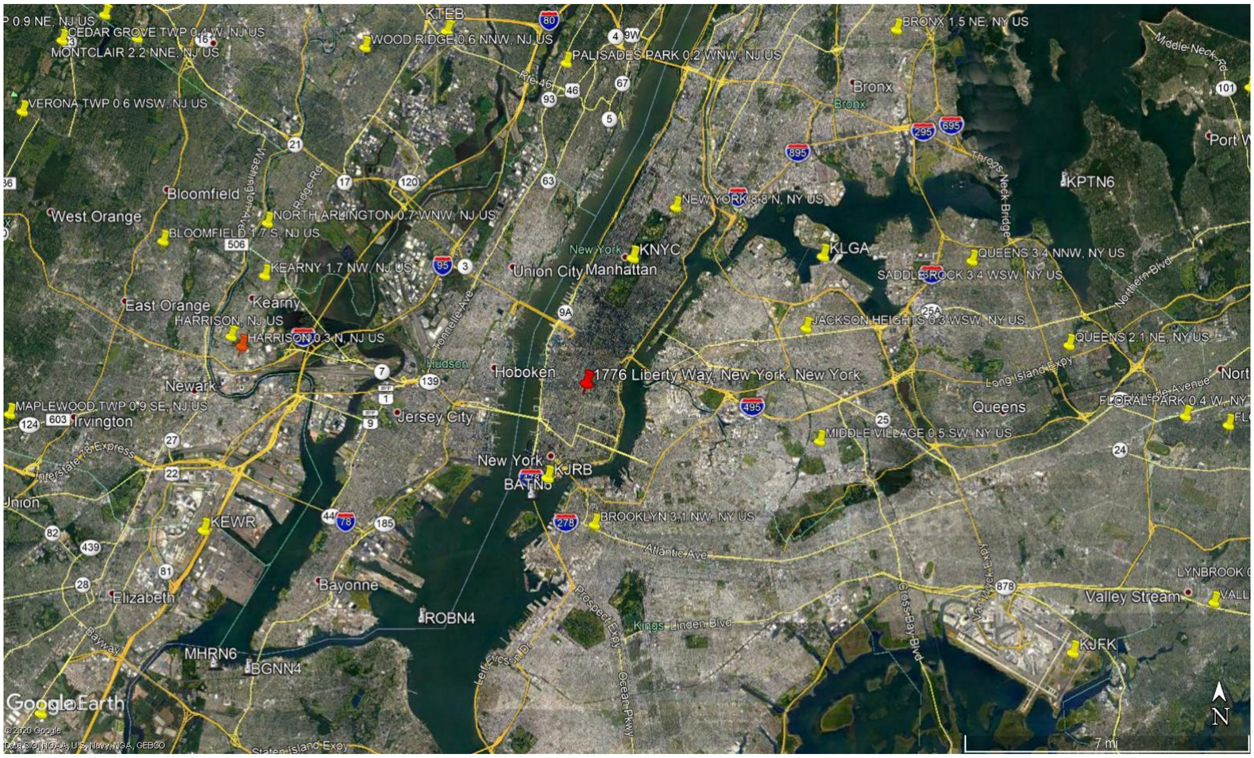
One of the most effective tools to detect precipitation is radar. Radar, which stands for RAdio Detection And Ranging, has been utilized to detect precipitation, and especially thunderstorms, since the 1940's. The radar used by the National Weather Service is called the WSR-88D, which stands for Weather Surveillance Radar - 1988 Doppler (the prototype radar was built in 1988). As its name suggests, the WSR-88D is a **Doppler radar**, meaning it can detect motions toward or away from the radar as well as the location of precipitation areas. There are approximately 155 WSR-88D Doppler radar in the nation, including the U.S. Territory of Guam and the Commonwealth of Puerto Rico, operated by the National Weather Service and the Department of Defense. Doppler radar images and several other types of weather records were used in this study. Doppler radar images are useful for locating precipitation. As the radar unit sends a pulse of energy into the atmosphere and if any precipitation is intercepted by the energy, part of the energy is scattered back to the radar. These return signals, called "radar echoes", are assembled to produce radar images. The location of these radar echoes helps indicate where precipitation may be falling, and the various colors on the color code key on the right side of the radar image indicates intensity. Doppler radar images are processed approximately every 1 to 5 minutes and can determine if precipitation was falling at the incident location and if so, when it started and stopped.

Storm Total Precipitation (S.T.P.) images are also received approximately every 6 minutes and give an estimate as to how much rain has accumulated with the storm. The S.T.P. images are especially useful in determining rainfall amounts where rain measurement equipment is not present. In order to generate the S.T.P Doppler Radar images, the National Oceanic and Atmospheric Administration's (NOAA's) Weather and Climate Toolkit was utilized. It is important to note that within this radar-viewing program, the locations of most airports are indicated by a green pushpin. In addition, the locations of the Automated Surface Observing Systems (ASOS)/Automated Weather Observing Systems (AWOS) are indicated by a blue pushpin. These airports and weather stations are plotted in locations corresponding to the metadata on file with the National Centers for Environmental Information.

The National Weather Service (NWS) offices around the country issue numerous weather alerts, advisories, warnings, statements, bulletins, and storm reports and these are also utilized in our investigations. A map depicting the locations of these NWS offices can be found below.



The incident location was plotted by our office and is indicated by a red pushpin. The map will help give you an approximate location of the weather stations we used in this study and their proximity to the incident location.



<u>In order to perform my analysis of the weather conditions that existed, I obtained and reviewed official copies of the following weather records (the distance from the incident location and each weather station is also provided)</u>:

a. Surface Weather Observations from the Downtown Manhattan/Wall Street Heliport in New York, New York (approximately xxx miles xxxxx of the incident location).

b. Surface Weather Observations from NOAA's National Ocean Service Station BATN6 – 8518750 – The Battery, New York (approximately xxx miles xxxxx of the incident location).

c. National Weather Service Hourly Surface Weather Observations/Local Climatological Data (LCD) from the Central Park Observatory in New York, New York (approximately xxx miles xxxxx of the incident location).

d. National Weather Service Hourly Surface Weather Observations/Local Climatological Data (LCD) from LaGuardia Airport in Queens, New York (approximately xxx miles xxxxx of the incident location).

e. National Weather Service Hourly Surface Weather Observations/Local Climatological Data (LCD) from the Newark Liberty International Airport in Newark, New Jersey (approximately xxx miles xxxxx of the incident location).

f. 5-Minute Surface Observations from the Central Park Observatory in New York, New York.

g. 5-Minute Surface Observations from LaGuardia Airport in Queens, New York.

h. 5-Minute Surface Observations from the Newark Liberty International Airport in Newark, New Jersey.

i. Cooperative Observer Program (COOP) weather station reports from Harrison, New Jersey (approximately xxx miles xxxxx of the incident location).

j. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from New York 8.8 N, New York (approximately xxx miles xxxxx of the incident location).

k. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Jackson Heights 0.3 WSW, New York (approximately xxx miles xxxxx of the incident location).

l. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Brooklyn 3.1 NW, New York (approximately xxx miles xxxxx of the incident location).

m. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Middle Village 0.5 SW, New York (approximately xxx miles xxxxx of the incident location).

n. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Palisades Park 0.2 WNW, New Jersey (approximately xxx miles xxxxx of the incident location).

o. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Kearny 1.7 NW, New Jersey (approximately xxx miles xxxxx of the incident location).

p. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from North Arlington 0.7 WNW, New Jersey (approximately xxx miles xxxxx of the incident location).

q. Online Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports for Bergen County in New Jersey, Hudson County in New Jersey, New York County in New York, Queens County in New York, and Kings County in New York.

r. Super-resolution Reflectivity Doppler Radar images from the Upton, New York radar site that were zoomed in over the incident location.

s. Storm Total Precipitation (S.T.P.) Doppler radar images from the Upton, New York radar site that were zoomed in over the incident location.

t. Various weather bulletins, advisories and statements that were issued by the National Weather Service in Upton, New York.

u. Astronomical data from New York, New York on March 21, 2019 and March 22, 2019.

v. United States Surface Analysis Images from the Weather Prediction Center (WPC).

w. Storm Events Database from the National Centers for Environmental Information (NCEI) for New York County in New York.

The weather data and Climatological records used for this analysis are the official records that Meteorologists rely upon every day during the normal course of business and are either kept in our office or at the National Centers for Environmental Information. The findings in this report utilize the weather records that were available at the time of data retrieval for this case. Any additional weather records and data that become available at a later date may be incorporated into this report in the future.

<u>In addition to the weather records and climatological data listed above, I also reviewed the following information that was provided to me</u>:

- Plaintiff's Verified Bill of Particulars
- Incident Report from New York Property, LLC
- Video Surveillance Footage

It should be noted that the radar image date and time stamps that are given on the Doppler radar images are given in "GMT", which is Greenwich Mean Time. In order to convert "GMT" to Eastern Daylight Time (EDT), a subtraction of 4 hours is necessary. Additionally, the hourly surface weather observations / Local Climatological Data are given in "Local Standard Time" which requires a one-hour forward time adjustment to obtain "Eastern Daylight Time (EDT)". The only exception to this is that <u>some</u> of the remarks themselves are given in GMT. The findings in this report have incorporated and converted all of these times correctly.

<u>METHODOLOGY:</u>

After plotting the incident location on Google Earth, we were able to determine what weather stations were near and/or surrounding the incident location. The distances and directions between the incident location and various weather stations were then calculated. After obtaining numerous weather records from sources customarily relied upon in these types of investigations, the data was analyzed, including extrapolation of the data from many weather stations, in order to determine the weather and ground conditions that existed at the incident location leading up to and including the day of the incident.

In order to formulate an opinion about the daily maximum and minimum temperatures that occurred at the incident location leading up to including the day of the incident, we reviewed the meteorological data and extrapolated between the following weather stations:

- Central Park Observatory in New York, New York (approximately xxx miles xxxxx of the incident location).
- Downtown Manhattan/Wall Street Heliport in New York, New York (approximately xxx miles xxxxx of the incident location).

It is important to note that while extrapolating between the weather stations utilized in this study, we considered the distances and directions of each weather station from the incident location.

In addition, we reviewed the weather records from the following weather stations and compared these ground truth observations to Storm Total Precipitation (S.T.P.) Doppler radar images that were zoomed in over the incident location. By adjusting the S.T.P. Doppler radar estimated rainfall based on the ground truth observations from these weather stations, we were then able to determine the rainfall total that accumulated for the 24-hour period (in inches) at the incident location.

- Central Park Observatory in New York, New York (approximately xxx miles xxxxx of the incident location).
- New York 8.8 N, New York (approximately xxx miles xxxxx of the incident location).
- Downtown Manhattan/Wall Street Heliport in New York, New York (approximately xxx miles xxxxx of the incident location).
- Brooklyn 3.1 NW, New York (approximately xxx miles xxxxx of the incident location).

On March 21st and 22nd, 2019 (the day before and day of the incident), the following surface weather observations were analyzed to help determine what types of precipitation were reported and when they occurred:

- National Weather Service Hourly Surface Weather Observations/Local Climatological Data (LCD) from the Central Park Observatory in New York, New York (approximately xxx miles xxxxx of the incident location).
- Surface Weather Observations from the Downtown Manhattan/Wall Street Heliport in New York, New York (approximately xxx miles south-xxxxx of the incident location).

We also downloaded super-resolution base reflectivity Doppler radar images obtained from the National Oceanic and Atmospheric Administration (NOAA), and these images were zoomed in over the incident location. Using the Doppler radar images in conjunction with the surface observations from these weather stations, we were able to determine when any precipitation that occurred at the incident location started and stopped over the course of each day within a reasonable degree of meteorological certainty.

Additionally, we reviewed various National Weather Service bulletins, public information statements, advisories and warnings that were issued for the incident location and surrounding areas for the period of this investigation.

ANALYSIS:

To determine the total rain accumulation for each 24-hour period, Storm Total Precipitation (S.T.P.) Doppler Radar images were used (**Figures 1-4**). S.T.P. values at the incident location and the Central Park Observatory were determined, and then compared to ground truth observations from the Central Park Observatory. It should be noted that these S.T.P. images were cumulative over these 2 days, so the appropriate subtractions of the previous days' rainfall amounts were applied. Thus, the rainfall amounts given below are for each 24-hour day.

Additionally, using S.T.P. Doppler radar, the total rain that accumulated leading up to the time of the incident was also determined (**Figure 5**).

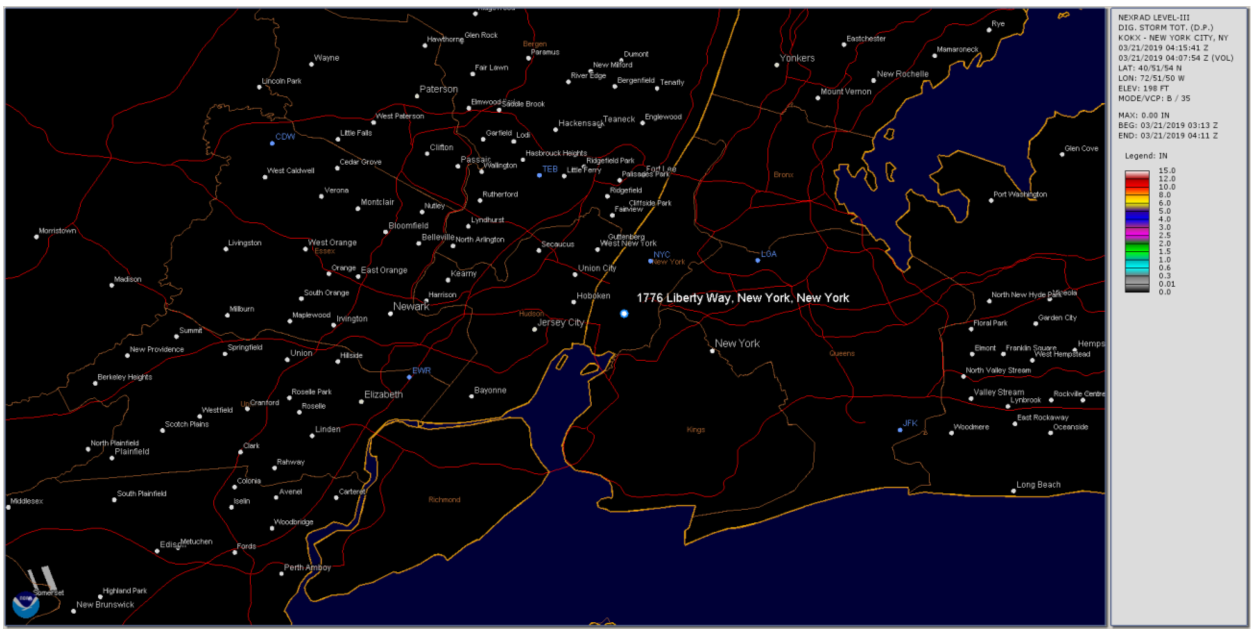


Figure 1: The Storm Total Precipitation (S.T.P) Doppler radar image above indicated that no rain accumulated at the incident location or at the Central Park Observatory through 12:07 a.m. EDT on March 21st, 2019.

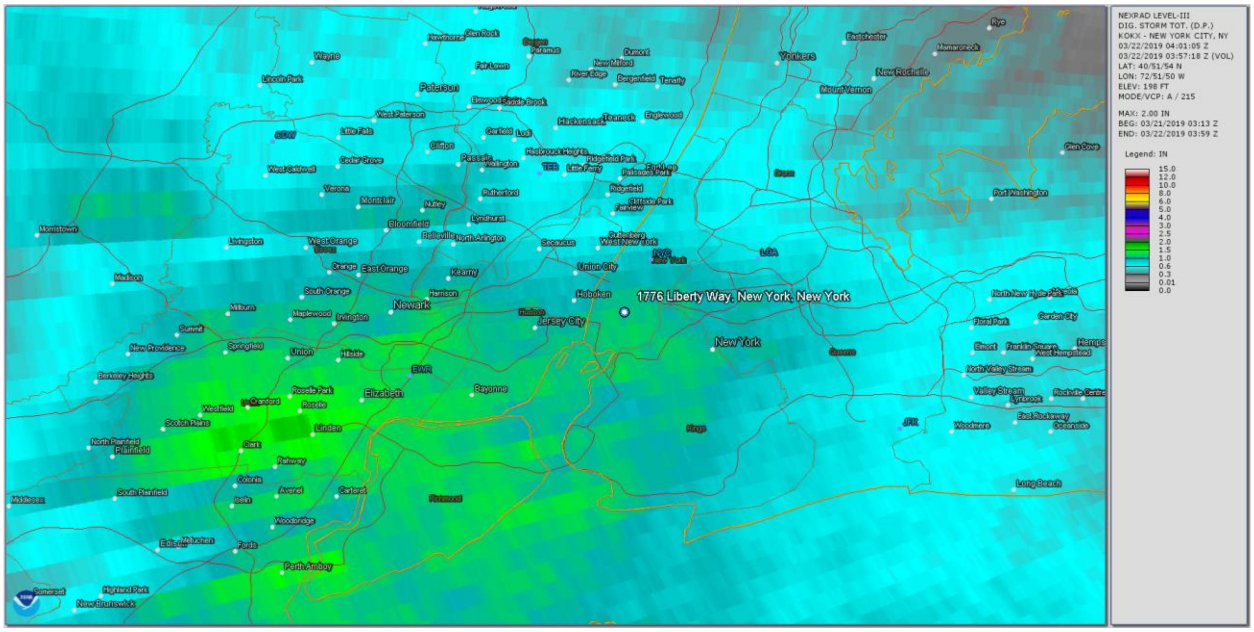


Figure 2: The Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 1.25” of rain accumulated at the incident location and approximately 1.00” of rain accumulated at the Central Park Observatory through 11:57 p.m. EDT on March 21st, 2019.

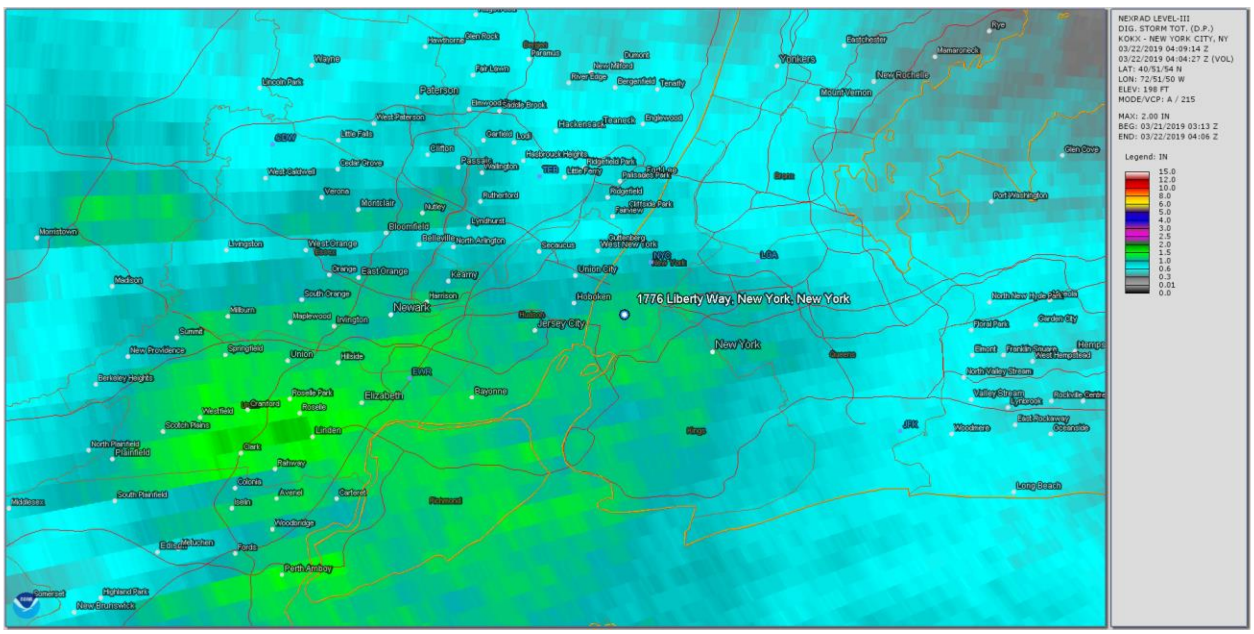


Figure 3: The Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 1.30” of rain accumulated at the incident location and approximately 1.05” of rain accumulated at the Central Park Observatory through 12:04 a.m. EDT on March 22nd, 2019.

Based on the S.T.P. Doppler radar images, approximately 1.27” of rain accumulated at the incident location and approximately 1.02” of rain accumulated at the Central Park Observatory on March 21st, 2019.

The actual observed rainfall total for the day was 0.62" at the Central Park Observatory on March 21st, 2019. Thus, S.T.P. Doppler Radar was overestimating the rain accumulation over both the Central Park Observatory and the incident location by approximately 0.40" on March 21st, 2019.

By subtracting the 0.40" rain accumulation anomaly from the S.T.P. Doppler radar estimation of 1.27" at the incident location, the total rain accumulation that occurred at the incident location was approximately 0.87" on March 21st, 2019.

The same method was then used to calculate the total rain accumulation on March 22nd, 2019.

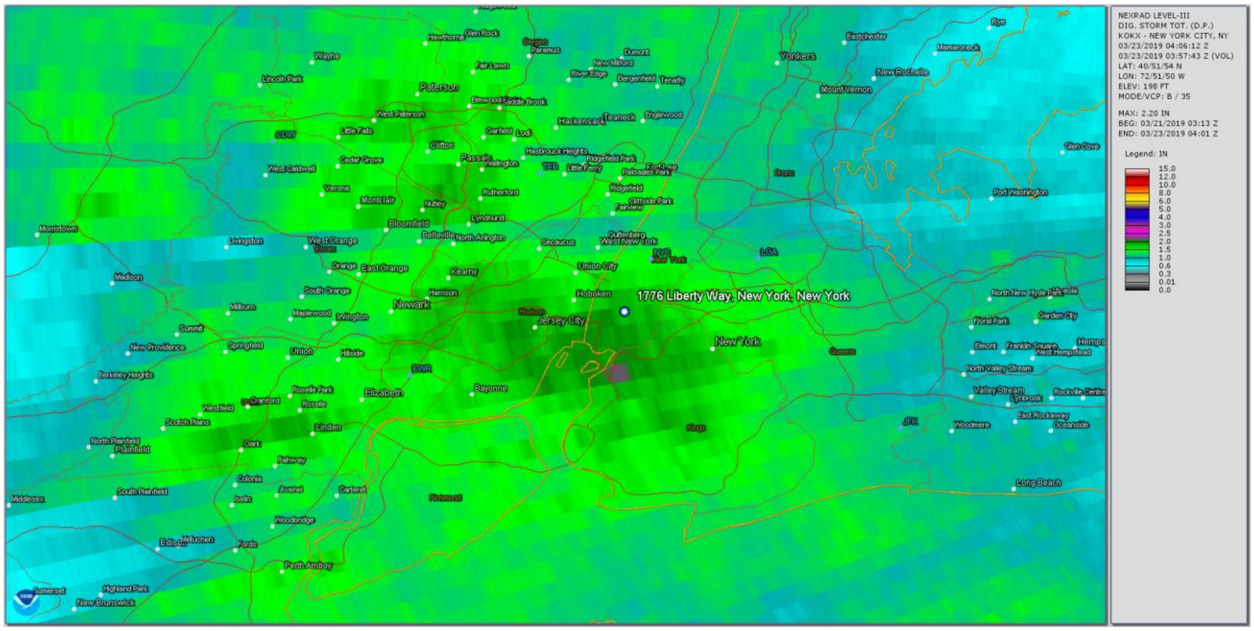


Figure 4: The Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 1.75" of rain accumulated at the incident location and approximately 1.50" of rain accumulated at the Central Park Observatory through 11:57 p.m. EDT on March 22nd, 2019.

The S.T.P. Doppler radar image at 11:57 p.m. on March 22nd, 2019 indicates that approximately 1.75" of rain had accumulated at the incident location and approximately 1.50" of rain had accumulated at the Central Park Observatory.

By subtracting the rain that actually accumulated on March 21st, 2019, the total rain accumulation indicated by S.T.P was approximately 0.48" at the incident location and approximately 0.48" at the Central Park Observatory.

The actual observed rainfall total for the day was 0.81" at the Central Park Observatory on March 22nd, 2019. Thus, S.T.P. Doppler Radar was underestimating the rain accumulation over both the Central Park Observatory and the incident location by approximately 0.33" on March 22nd, 2019.

By adding the 0.33" rain accumulation anomaly from the S.T.P. Doppler radar estimation of

0.48" at the incident location, the total rain accumulation that occurred at the incident location was approximately 0.81" on March 22nd, 2019.

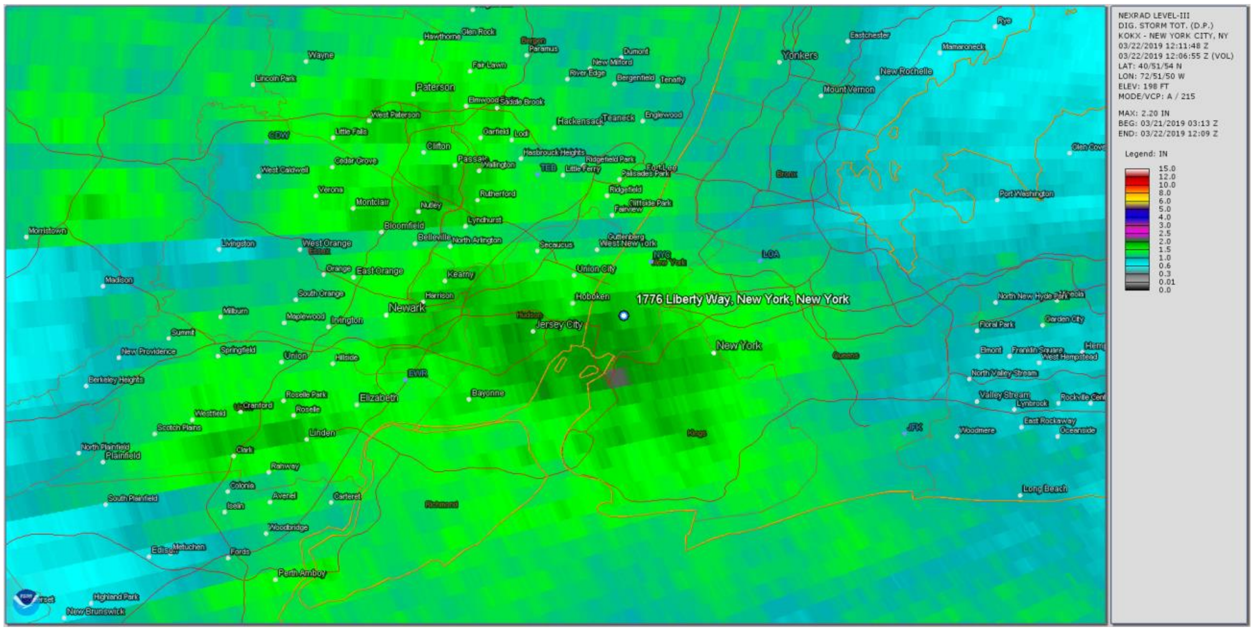


Figure 5: The Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 1.73" of rain accumulated at the incident location through 8:06 a.m. EDT on March 22nd, 2019 (approximately one minute after the time of the incident),

By subtracting the rain that actually accumulated on March 21st, 2019, the total rain accumulation through 8:06 a.m. on March 22nd, 2019 (one minute after the time of the incident), as indicated by S.T.P, was approximately 0.46" at the incident location.

By adding the 0.33" rain accumulation underestimation from the S.T.P. Doppler radar measurement of 0.46" at the incident location, the total rain accumulation that occurred at the incident location was approximately 0.79" through the time of the incident on March 22nd, 2019.

The following table is a summary of the daily weather conditions day by day at the location of the incident. This summary includes the date, the Maximum temperature for the 24-hour period (in Fahrenheit), the Minimum temperature for the 24-hour period (in Fahrenheit) and the total rain accumulation for the 24-hour period (in inches).

MARCH 2019

Date	Maximum Air Temperature	Minimum Air Temperature	Rain Accumulation
3/21	47	41	0.87"
3/22	50	39	0.81"

MARCH 21, 2019 (DAY BEFORE THE INCIDENT)

On March 21st, 2019 (day before the incident), Doppler radar images that were zoomed in over the incident location and nearby surface observations indicated that periods of light to occasionally moderate and heavy rain fell from approximately 5:24 a.m. through and beyond 11:59 p.m.

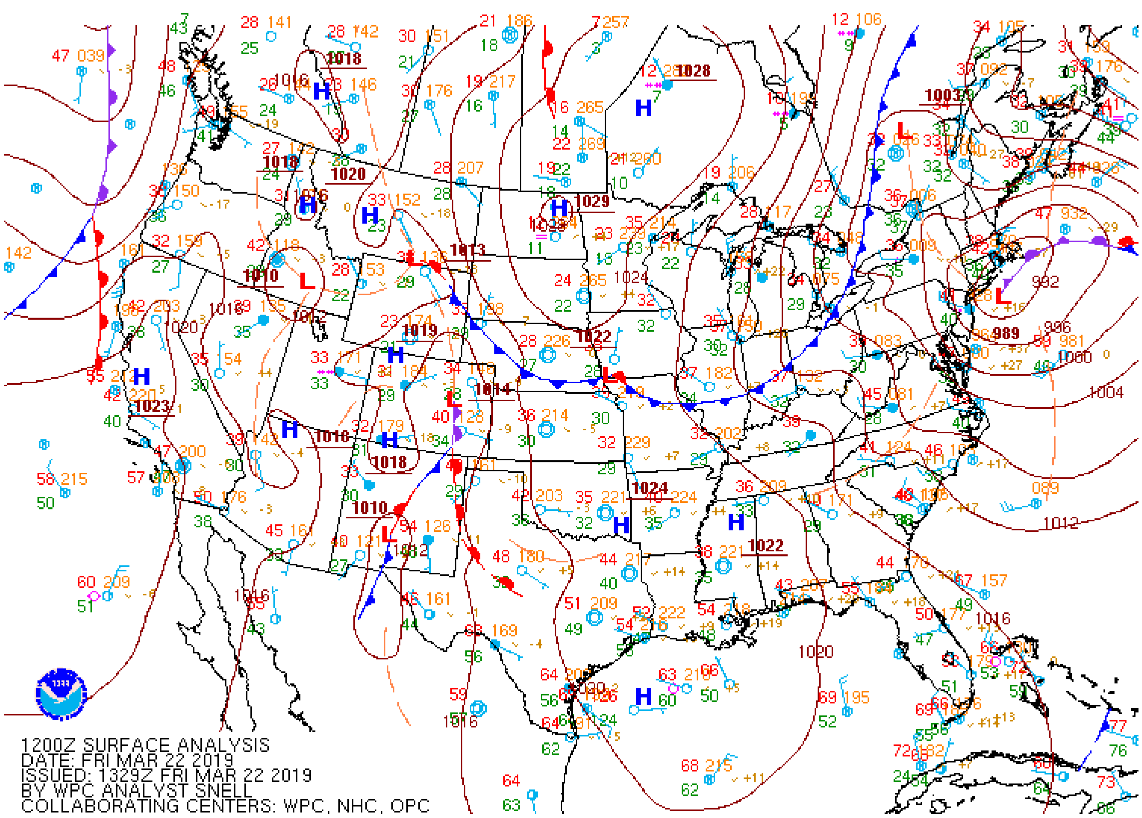
Approximately 0.87" of rain accumulated on March 21st, 2019 (day before the incident).

Sunset at the incident location occurred at approximately 7:09 p.m. on March 21st, 2019.

On March 21st, 2019, the maximum air temperature was 47 degrees Fahrenheit and the minimum air temperature was 41 degrees Fahrenheit.

MARCH 22, 2019 (DAY OF THE INCIDENT)

The following is a surface analysis map of the contiguous United States at 8:00 a.m. EDT on March 22nd, 2019 that was prepared by the Weather Prediction Center (WPC), a division of the National Weather Service. This surface map indicated that a storm system with an occluded front was located just to the south of Long Island, New York. A surface trough was located from this storm system to an area of low pressure to the north of New York State. Another surface trough was located just to the south of the Canadian Maritimes. A cold front was located from well to the north of the Northeast United States over Canada through Missouri.



On March 22nd, 2019 (day of the incident), the same storm system that caused rain to fall on March 21st, 2019 was still causing rain to fall at 12:00 a.m. Doppler radar images that were zoomed in over the incident location and nearby surface observations indicated that mostly continuous light to occasionally moderate and heavy rain fell from 12:00 a.m. through approximately 11:45 a.m.

Approximately 0.81” of rain accumulated on March 22nd, 2019 (day of the incident).

At 8:05 a.m. on March 22nd, 2019 (time and date of the incident), light rain was falling, rain was actively accumulating as a result of the storm that was still in progress, and the air temperature was 43 degrees Fahrenheit. Approximately 1.66” of rain accumulated from approximately 5:24 a.m. on March 21st, 2019 through 8:05 a.m. on March 22nd, 2019 (time and date of the incident) and exposed outdoor surfaces were wet with areas of standing water present.

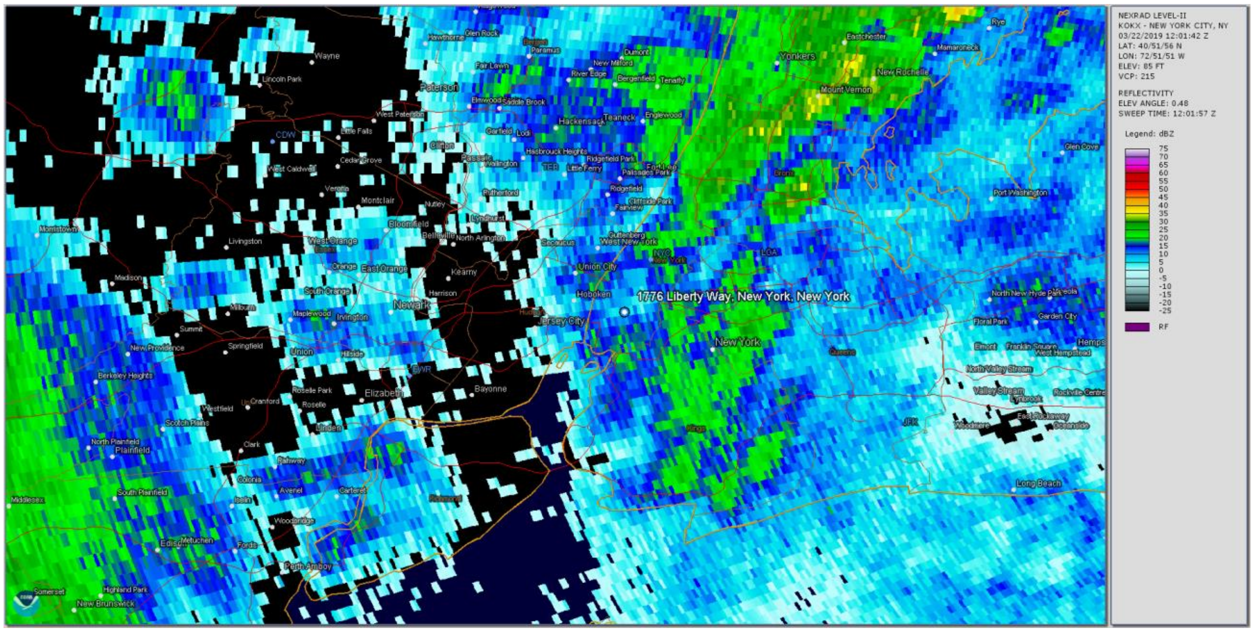
On March 22nd, 2019, the maximum air temperature was 50 degrees Fahrenheit and the minimum air temperature was 39 degrees Fahrenheit.

DOPPLER RADAR ANALYSIS

The following images are Base Reflectivity Doppler radar images that were processed at 12:01:42 GMT and 12:06:55 GMT (8:01 a.m. EDT and 8:06 a.m. EDT) on March 22nd, 2019. The incident location is indicated by a white pushpin on the base map. The color code on the right side indicates the intensity of the precipitation.

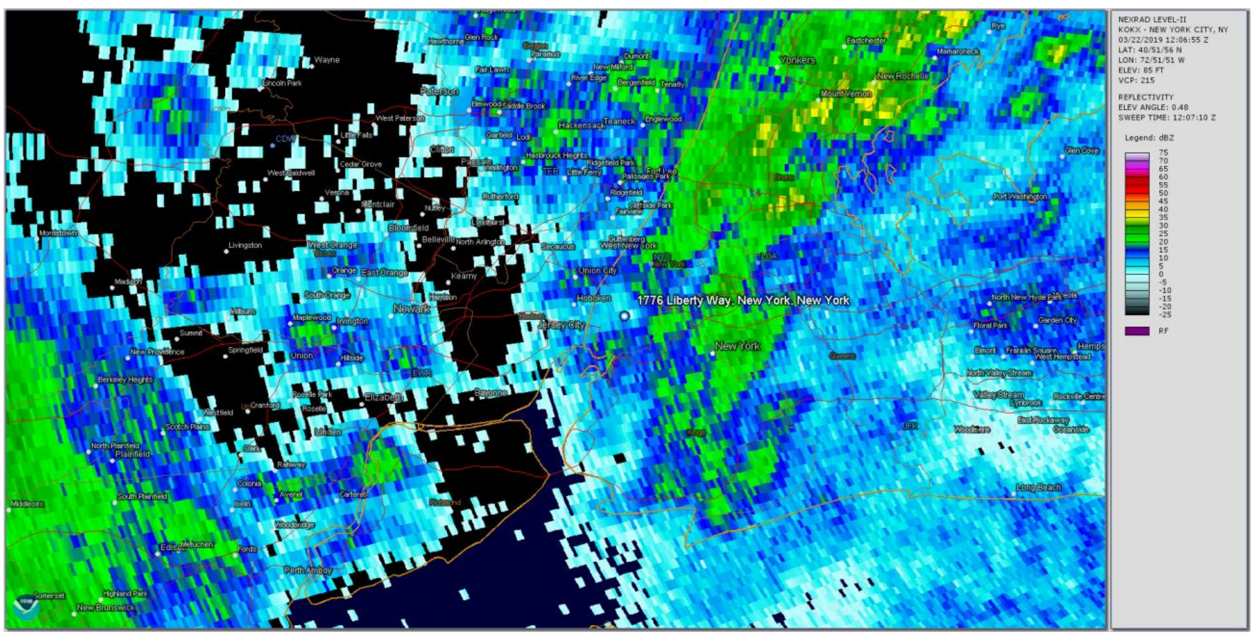
Doppler Radar Image from 8:01 a.m. EDT on March 22nd, 2019

The following Doppler radar image was processed approximately four (4) minutes prior to the time of the incident. This image and nearby surface observations indicate that light rain was falling at the incident location.



Doppler Radar Image from 8:06 a.m. EDT on March 22nd, 2019

The following Doppler radar image was processed approximately one (1) minute after the time of the incident. This image and nearby surface observations indicate that light rain was falling at the incident location.



CONCLUSIONS

In conclusion, it is my opinion that:

- A storm system caused light to occasionally moderate and heavy rain to fall, with some occasional lulls, from approximately 5:24 a.m. on March 21st, 2019 through 11:45 a.m. on March 22nd, 2019.
- Approximately 1.68" of rain accumulated at the incident location as a result of this storm on March 21st and 22nd, 2019.
- At 8:05 a.m. on March 22nd, 2019 (time and date of the incident), light rain was falling, rain was actively accumulating as a result of the storm that was still in progress, and the air temperature was 43 degrees Fahrenheit. Approximately 1.66" of rain accumulated from approximately 5:24 a.m. on March 21st, 2019 through 8:05 a.m. on March 22nd, 2019 (time and date of the incident) and exposed outdoor surfaces were wet with areas of standing water present.
- Rain was actively falling and accumulating before, during, and beyond the time of the incident as a result of the ongoing storm system that was still in progress. Exposed outdoor surfaces were wet with areas of standing water present as a result of this storm.
- As part of our investigation, we also reviewed video surveillance footage that was provided to us by McDonald, Pfeiffer & LaCosta, LLP. This footage shows the Plaintiff Mr. Walters slipping and falling in the lobby as soon as he stepped off the carpeted area. It should be noted that this footage also showed wet pavement and sidewalk surfaces outside, as well as people walking by with their umbrellas up as a result of the ongoing rainfall. It is likely, as a result of the rain and wet ground that was present outside, that wetness was tracked into the lobby as a result of foot traffic that occurred in this area. This caused slippery surfaces to be present on the lobby floor.

CERTIFICATION

I certify that the above information contained in this report is true and accurate to the best of my ability and that all of my opinions, findings, estimations, and interpolations expressed in this report were made with accuracy as a professional meteorologist within a reasonable degree of meteorological certainty.

By: ______________________________

Certified Consulting Meteorologist

Certified Consulting Meteorologist
Awarded by the American Meteorological Society.